MITCHELL | HAMLINE School of Law

William Mitchell Law Review

Volume 25 | Issue 1 Article 22

1999

Gatekeeping Soothsayers, Quacks and Magicians: Defining Science in the Courtroom—Judging Science: Scientific Knowledge and the Federal Courts

Eileen Gay Jones

GATEKEEPING SOOTHSAYERS, QUACKS AND MAGICIANS: DEFINING SCIENCE IN THE COURTROOM —*JUDGING SCIENCE: SCIENTIFIC KNOWLEDGE AND THE FEDERAL COURTS*†

Eileen Gay Jones††

"Scientific conclusions are subject to revision. Law, on the other hand, must resolve disputes finally and quickly."[1]

I. INTRODUCTION

How do we decide that a finding, study, or other piece of information or phenomenon is scientific? Fundamentally, our understanding requires us to define science. The process of deciding what is and what is not scientific has proven controversial in our legal system. Underlying the controversy is what proves to be a harsh reality for litigants: without expert testimony, a party may not be able to establish her claim. Determining the validity of scientific testimony in federal court is governed by the principles annunciated in a 1993 Supreme Court opinion. In *Daubert v. Merrell Dow Pharmaceuticals, Inc.*,[2] the Supreme Court considered what constituted scientific knowledge pursuant to Rule 702 of the Federal

† KENNETH R. FOSTER & PETER W. HUBER, JUDGING SCIENCE: SCIENTIFIC KNOWLEDGE AND THE FEDERAL COURTS (1997). Kenneth R. Foster is an Associate Professor of Bioengineering, University of Pennsylvania; Peter W. Huber serves as a Senior Fellow of the Manhattan Institute.

†† Assistant Professor, Southern University Law Center.

1. Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 597 (1993).
2. 509 U.S. 579 (1993).

William Mitchell Law Review, Vol. 25, Iss. 1 [1998], Art. 22

Rules of Evidence.[3] The decision has stirred a steady stream of debate. The number of academic articles in which *Daubert* is cited exceeds 1,000;[4] it seems as if everyone has taken a spin.[5] The Supreme Court's decision continues to generate a divergence of opinions between and within the circuits.[6]

Daubert was intended to end the debate over the use of the *Frye* test[7] of admissibility of expert opinion.[8] During the period follow-

3. *See id.* at 589-90. The *Daubert* case involved a claim against a manufacturer of a drug that allegedly caused birth defects. *See id.* at 582. The plaintiff sought to introduce expert testimony based on animal studies, chemical structure analysis, and human statistical studies. *See id.* at 583-84. The trial court held and court of appeals affirmed that this evidence did not meet the requirements for admissibility set forth by *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923). *See Daubert*, 509 U.S. at 584-85 (citations omitted). The Supreme Court held that the trial judge must make a preliminary determination, the judge should consider testing of the scientific evidence, peer review and publication, its error rate, and standards for its operation and general acceptance. *See id.* at 593-96.

4. WESTLAW search performed on Sept. 30, 1998.

5. *See, e.g.*, Kenneth J. Chesebro, *Taking* Daubert*'s "Focus" Seriously: The Methodology/Conclusion Distinction*, 15 CARDOZO L. REV. 1745 (1994) (arguing that *Daubert* is best understood by concentrating on the distinction between the "principles and methodology" used by an expert and the "conclusions" thereby reached by the expert); Michael H. Gottesman, *Should Federal Evidence Rules Trump State Tort Policy? The Federalism Values Daubert Ignored*, 15 CARDOZO L. REV. 1837 (1994) (arguing that federal courts should not trump state choices concerning when expert testimony will be admissible in litigation over issues controlled by state law, nor should they trump state choices as to what evidence is sufficient to establish a state law claim); Clifton T. Hutchinson & Danny S. Ashby, Daubert v. Merrell Dow Pharmaceuticals, Inc.*: Redefining the Bases for Admissibility of Expert Scientific Testimony*, 15 CARDOZO L. REV. 1875 (1994) (concluding that while no theory of admissibility of scientific testimony can eliminate all "battles of the experts," *Daubert* provides a workable framework for limiting the battle to disputes in which the application of well-founded contested theories reasonably may lead to different conclusions).

6. *See* Jay P. Kesan, *A Critical Examination of the Post-*Daubert *Scientific Landscape*, 52 FOOD & DRUG L.J. 225, 237-39 (1997) (noting various circuit court decisions that have both narrowly and liberally construed *Daubert*); Douglas P. Richard, *Regulating Expert Testimony*, 62 MO. L. REV. 485, 501-02 (1997) (recognizing the liberal construction of *Daubert*); Nancy S. Ferrell, *Congressional Action to Amend Federal Rule of Evidence 702: A Mischievous Attempt to Codify* Daubert v. Merrell Dow Pharmaceuticals, Inc., 13 J. CONTEMP. HEALTH L. & POL'Y 523, 540-41 (1997) (noting that circuit court decisions reflect an underlying tension as to exactly how and when the *Daubert* analysis will lead to the inadmissibility of expert testimony).

7. *See* Frye v. United States, 293 F. 1013 (D.C. Cir. 1923). The *Frye* court addressed the admissibility of expert testimony concerning the validity of a systolic blood pressure deception test, an early form of lie detector. *See id.* at 1013. The *Frye* court held that to be admitted, expert testimony must be deduced from principles or discoveries that are "sufficiently established to have gained general acceptance in the particular field in which it belongs." *Id.* at 1014. The court held that the test had not "gained general acceptance" in the scientific community. *Id.* For

ing the passage of the Federal Rules of Evidence in 1975 and prior to *Daubert*, courts were presented with essentially two choices when addressing the issue of expert testimony: the traditional common law rule first articulated in *Frye*, or a new rule based on the language of Rule 702.[9] Under *Frye*, expert testimony was admissible if based on "generally accepted" scientific technique.[10] The rule became questioned upon the enactment of the Federal Rules of Evidence, which did not codify the "generally accepted" language from *Frye*. Rather, Rule 702 provides:

> If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.[11]

Some pre-*Daubert* courts were unwilling to graft "generally accepted" onto the language of Rule 702.[12] In 1993, the Supreme Court agreed and displaced the *Frye* rule with the Court's newly-minted interpretation of "scientific . . . knowledge."[13] The Court created a non-exhaustive, multi-factor test to use in determining whether or not proposed testimony constituted scientific knowl-

---

a summary of the history of *Frye* and its influence on the law of evidence, see 1 DAVID L. FAIGMAN ET AL., MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY §§ 1-2.1—1-2.4 (1997).

8. *See Daubert*, 509 U.S. at 585 (noting that a split in decisions of different courts of appeals was one reason the Supreme Court decided to accept the appeal).

9. *Compare* United States v. Shorter, 809 F.2d 54, 59-60 (D.C. Cir. 1987) (applying the "general acceptance" standard) *with* DeLuca v. Merrell Dow Pharm., Inc., 911 F.2d 941, 955 (3d Cir. 1990) (rejecting the "general acceptance" standard).

10. *See Frye*, 293 F. at 1014. *Frye* was not without its critics. *See* CHARLES T. MCCORMICK, HANDBOOK OF THE LAW OF EVIDENCE § 170, at 363 (1954) (commenting on the inherent difficulty of applying the "general acceptance" test of *Frye*). For a more in-depth discussion of pre-*Daubert* rules for testing the admissibility of expert testimony, see Jay P. Kesan, *An Autopsy of Scientific Evidence in a Post-*Daubert *World* , 84 GEO. L.J. 1985, 1989-97 (1996) (comparing the *Frye* test to other pre-*Daubert* approaches to the admissibility of scientific evidence).

11. FED. R. EVID. 702.

12. *See, e.g., DeLuca*, 911 F.2d at 955 (noting that the *Frye* rule was too vague and often yielded inconsistent results).

13. *Daubert*, 509 U.S. at 589.

edge.[14] The factors include the condition that expert testimony be relevant.[15] Proposed testimony also must be reliable based upon a showing of "scientific validity."[16] The proposed testimony is judged for its "scientific connection to the pertinent inquiry."[17] Whether the methodology which is the foundation for the proposed testimony can be (or has been) tested can also be considered.[18] Peer review and publication may also aid in determining the admissibility of expert opinion.[19] The rate of error for a scientific technique is another factor.[20] Whether a particular technique is accepted within the relevant scientific community is also a consideration.[21] While the Court resolved the issue of whether *Frye* survived the passage of the Federal Rules of Evidence, it invited different approaches to analyzing the admissibility of expert opinion: "The inquiry envisioned by rule 702 is . . . a flexible one."[22] Non-standardized approaches are further encouraged by the standard of review, manifestly erroneous, giving district court's broad discretion.[23]

---

14. *See id.* at 593 n.12.
15. *See id.* at 591.
16. *Id.* at 593.
17. *Id.* at 592.
18. *See id.* at 593. In a subsequent case, *General Electric Co. v. Joiner*, 118 S. Ct. 512, 519 (1997) the Court explained that:

> [N]othing in either Daubert or the Federal Rules of Evidence requires a district court to admit opinion evidence which is connected to existing data only by the ipse dixit of the expert. A court may conclude that there is simply too great an analytical gap between the data and the opinion proffered.

Id.

19. *See Daubert*, 509 U.S. at 593.
20. *See id.* at 594.
21. *See id.*
22. *Id.*
23. *See General Elec.*, 118 S. Ct. at 517.

II. REVIEWING *JUDGING SCIENCE*

A. *Foster and Hubert on* Daubert

In *Judging Science: Scientific Knowledge and the Federal Courts*,[24] Foster and Huber join the cacophony of voices suggesting various interpretations of *Daubert*. They illustrate how Rule 702 may be interpreted to exclude a proposed expert's testimony, using the facts of *Daubert* as a case study. Each major chapter focuses on a *Daubert* factor. In Chapter 2, "fit" is explored.[25] In Chapter 3, testing is discussed.[26] Here, Foster and Huber focus on the Court's discussion on the theory and process of falsification in scientific methodology.[27] In Chapter 4, Foster and Huber explain scientific conceptions about rate of error and its role in scientific methodology.[28] Another factor, reliability, is developed in Chapter 5.[29] Foster and Huber spend considerable time summarizing Bayesian statistics as a means of determining reliability.[30] The validity of a particular scientific methodology is the subject of Chapter 6.[31] Finally, the role of peer review in the scientific community is introduced in Chapter 7.[32] The last major chapter, Chapter 8, provides Foster and Huber's interpretation of Federal Rule of Evidence 403.[33]

Foster and Huber are to be commended for summarizing and explaining scientific concepts to their presumably neophyte audi-

24. KENNETH R. FOSTER & PETER W. HUBER, JUDGING SCIENCE: SCIENTIFIC KNOWLEDGE AND THE FEDERAL COURTS (1997).

25. *See id.* at 23-36.

26. *See id.* at 37-68.

27. *See id.* at 38-44.

28. *See id.* at 69-110.

29. *See id.* at 111-36.

30. *See id.* at 147-50.

31. *See id.* at 137-62.

32. *See id.* at 163-205.

33. *See id.* at 207-24. Rule 403 allows for the exclusion of evidence "if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury." FED. R. EVID. 403. "The underlying premise of the Rule is that certain relevant evidence should not be admitted to the trier of fact where the admission would result in an adverse effect upon the effectiveness or integrity of the fact finding process." GLEN WEISSENBERGER, FEDERAL RULE OF EVIDENCE: RULES, LEGISLATIVE HISTORY, COMMENTARY, AND AUTHORITY § 403.1 (2d ed. 1995). In addition to Rule 702, a judge may rely on Rule 403 to exclude scientific evidence that may mislead or confuse a jury. *See* CHRISTOPHER B. MUELLER & LAIRD C. KIRKPATRICK, MODERN EVIDENCE: DOCTRINE AND PRACTICE § 4.5 (1995).

ence. While decidedly a conservative viewpoint permeates their analysis, Foster and Huber's discussion of plaintiff's experts in Bendectin litigation proved insightful. Each chapter includes excerpts from outside firsthand sources. This format is appropriate since *Daubert* contemplates a certain level of scientific knowledge on the part of judges. But no one knows the extent to which that is a valid assumption.[34] Foster and Huber's book is one, among others, which could help fill deficiencies in judges, as well as lawyers, scientific understanding.[35] Judges and plaintiff's lawyers would be wise to give it a careful read. The book is a "how-to" for excluding plaintiffs' scientific experts. However, it is also a sound introduction to ideas and concepts which are the sine quo non of scientific understanding.

Implicit in Foster and Huber's discussion is the assumption that junk science[36] and trans-science[37] should be excluded from the courtroom.[38] This is not a new theme. Huber's prior works, particularly *Galileo's Revenge: Junk Science in the Courtroom*,[39] denounced what he considers poor-quality, expert scientific testimony.[40] *Judg-*

34. *Cf. General Electric Co.*, 118 S. Ct. at 520 (Breyer, J., concurring) (citing Briefs of the Trial Lawyers for Public Justice and New England Journal of Medicine as *Amicus Curiae*).

35. *See, e.g.*, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE (Federal Judicial Center 1994) (a treatise on scientific and technological evidence).

36. Foster and Huber explained:

> Junk science arises when a witness seeks to present grossly fallacious interpretations of scientific data or opinions that are not supported by scientific evidence. Junk science is a legal problem, not a scientific one. It is cultivated by the adversarial nature of legal proceedings, and it depends on the difficulty many laypeople have in evaluating technical arguments.

FOSTER & HUBER, *supra* note 24, at 17. *See also* PETER W. HUBER, GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM 2 (1991). "An example of 'junk science' that should be excluded under *Daubert* as too unreliable would be the testing of a phrenologist who would purport to prove a defendant's future dangerousness based on the contours of the defendant's skull." *General Elec.*, 118 S. Ct. at 522 n.6 (Stevens, J., concurring).

37. Trans-science involves questions "asked of science and yet which cannot be answered by science . . . . Though they are, epistemologically speaking, questions of fact and can be stated in the language of science, they are unanswerable by science; they transcend science." FOSTER & HUBER, *supra* note 24, at 56 (quoting Alvin M. Weinberg, *Science and Trans-Science*, 10 MINERVA 209 (1972)).

38. *See* FOSTER & HUBER, *supra* note 24, at 17, 56.

39. PETER W. HUBER, GALILEO'S REVENGE: JUNK SCIENCE IN THE COURTROOM (1991).

40. *See id.* at 3; Peter W. Huber, *Junk Science in the Courtroom*, 26 VAL. U. L. REV.

ing Science recycles Huber's prior work by casting the best conservative light on *Daubert*. From a conservative perspective this is significant since to date, *Daubert* analysis has provided an entrée to most experts, foreclosing the possibility of truncating the litigation process by means of excluding evidence necessary to support a claim.[41] For that reason alone, *Daubert* will continue to generate controversy. Additionally, the nature of the scientific enterprise and its juncture with law and the courts gives rise to questions over the admissibility of some expert testimony. We live in an era of rapidly changing science and technology[42] set in a context filled with debates over junk science[43] and cultural wars.[44] Underlying this phenomenon are debates over controlling knowledge, particularly scientific knowledge, and its function in supporting jury awards in personal injury/toxic tort cases.[45] Unpopular or novel science[46]

723, 755 (1992) (arguing for judges to cut out "junk" science in an attempt to reach reliable results). In *Galileo's Revenge*, Huber wrote:

> On the legal side, junk science is matched by what might be called liability science, a speculative theory that expects lawyers, judges, and juries to search for causes at the far fringes of science and beyond. The legal establishment has adjusted the rules of evidence accordingly, so that almost any self-styled scientist, not matter how strange or iconoclastic his views, will be welcome to testify in court.

HUBER, *supra* note 39, at 3.

41. *See* Richard, *supra* note 6, at 501-02 (noting that under *Daubert*, expert testimony is still liberally admitted); Kesan, *supra* note 6, at 238-39 (claiming that the *Daubert* admissibility requirements are quite liberal).

42. *See* Eileen Gay Jones, *Risky Assessments: Uncertainty in Science and the Human Dimensions of Environmental Decisionmaking*, 22 WM. & MARY ENVTL. L. REV. 1 (1997). *See also* JUDICIAL CONF. OF THE UNITED STATES, REPORT OF THE FEDERAL COURTS STUDY COMM. 97 (Apr. 2, 1990) ("Economic, statistical, technological, and natural and social scientific data are becoming increasingly important in both routine and complex litigation.").

43. *Compare* HUBER, *supra* note 39, *with* Kenneth J. Chesebro, *Galileo's Retort: Peter Huber's Junk Scholarship*, 42 AM. U. L. REV. 1637, 1722-26 (1993).

44. *See* Carl B. Meyer, *Science and the Law: The Quest for the Neutral Expert Witness: A View from the Trenches*, 12 J. NAT. RESOURCES & ENVTL. L. 35, 55-57 (1996-1997).

45. *See* Keum J. Park, *Judicial Utilization of Scientific Evidence in Complex Environmental Torts: Redefining Litigation Driven Research*, 7 FORDHAM ENVTL. L.J. 483, 504 (1996); Suzanne E. Riley, *The End of an Era: Junk Science Departs Products Liability*, 63 DEF. COUNS. J. 502, 507 (1996).

46. "Novel scientific evidence refers to evidence or theories that have not received approbation from the judicial or scientific communities." Erin K. L. Mahaney, *Assessing the Fitness of Novel Scientific Evidence in the Post-*Daubert *Era: Pesticide Exposure Cases as a Paradigm for Determining Admissibility*, 26 ENVTL. L. 1161, 1161 (1996) (citing 3 JACK B. WEINSTEIN & MARGARET A. BERGER, WEINSTEIN'S EVIDENCE

may be the only option for some plaintiffs.[47] We hear little about the use of non-traditional science being used by defense counsel.[48] This warrants further research.

B. Dangerous Science: Who Decides?

While the interpretation of *Daubert* poses interesting questions, the issues underlying the opinion are even more intriguing. One must ask why scientists are concerned with how courts interpret scientific data and findings. In some respects, Foster and Huber state too much, thus undermining their own presumptions in the process. While they argue that there is such an enterprise as good science, and indeed, provide a persuasive case for their brand of it, the book nevertheless stands as an illustration of the battles that are being waged among scientists.[49] Surely other scientists could provide their spin, different from Foster and Huber's, that would also be relevant and thoughtful.[50] Foster and Huber also fail to coherently address the pressing question implicit in their proposition that lay Americans and judges should be excluded from some areas of scientific inquiry, namely those not accepted by traditional scientific institutions, such as the National Academy of Sciences. The endeavors of scientists who have not been reviewed or accepted by elite scientific groups would be beyond the purview of non-scientists (particularly jurors) under Foster and Huber's proposal. Non-elite science may be ridden with errors, misleading, even dangerous, but the question is: who decides? This is a contextual question, requiring one to critically assess the purpose for which the information will be used. Specifically, who should judge the quality of the scientific endeavor for the purposes of one particular lawsuit? Foster and Huber want scientists to act as gatekeepers.

There are other issues raised by this premise that need further exploration. Should scientists sit as a de facto jury over a legal dispute between two private citizens? In the American form of de-

---

§ 702[03], at 702-43 (1995)).

47. *See id.* at 1176.

48. For further discussion on this topic, see Chesebro, *supra* note 32, at 1679-86.

49. *See* Anthony Z. Roisman, *Conflict Resolution in the Courts: The Role of Science*, 15 CARDOZO L. REV. 1945, 1951 (1994) (examining the proper role of science in litigation).

50. *See, e.g.*, Bert Black et al., *Science and the Law in the Wake of* Daubert*: A New Search for Scientific Knowledge*, 72 TEX. L. REV. 715 (1994).

mocracy, processes for seeking justice are housed in our governmental institutions, particularly our courts of law. We depend upon judges and jurors to make reasonable judgments reflective of community standards.[51] With seemingly few exceptions, albeit noteworthy and often sensationalized, they appear to do just that. Foster and Huber's select cases that may provide evidence to the contrary are not sufficiently persuasive[52] such that we should abandon an important aspect of participatory democracy. Replacing citizen jurors with a closed, elite body determining public issues is a quite serious proposition. Our system is not optimal in an absolute sense. Foster and Huber may very well be correct in their assumption that on the average Americans are scientifically illiterate.[53] The cure, however, is not to exclude them from making judgments about less popular forms of science. Rather, the nation should make a more concerted effort to educate the populace generally, and it is a function for lawyers to contextually educate jurors. Dark accounts of befuddled and mislead jurors,[54] if accurate, may reflect poor lawyering,[55] or that Foster and Huber are not accurate in their assessment of what constitutes "bad" science. If, for example, an expert's credentials are not stellar or appropriate for the testimony she will provide, it is the lawyer's function to reveal this to the jury. So while jurors may (or may not) come to court scientific illiterate, they need not deliberate that way. Good lawyering is also responsi-

51. *See* U.S. CONST. amend. VI (preserving the right to a trial by jury in criminal cases); U.S. CONST. amend. VII (preserving the right to a jury trial in civil cases).

52. *See* FOSTER & HUBER, *supra note* 24, at 233 (discussing breast implant litigation).

53. *See id* at 215, 250. *See also* DOROTHY J. HOWELL, SCIENTIFIC LITERACY AND ENVIRONMENTAL POLICY 61(1992) (discussing the difficulties in regulatory policy making in the pharmaceutical industry when the public does not have the capacity to judge the accountability of the scientific community).

54. *See* FOSTER & HUBER, *supra* note 24, at 249-50.

55. Competent cross-examination can expose weaknesses in testimony. As stated by Dr. Daryl E. Churbin: "All in all, whatever the pressures . . . generated by the peer review system, cross-examination is, quite literally, a far more trying experience." Brian Stuart Koukoutchos, *Solomon Meets Galileo (And Isn't Quite Sure What to Do with Him)*, 15 CARDOZO L. REV. 2237, 2251 (1994) (quoting Brief of *Amici Curiae* Daryl E. Churbin et al., at 29, Daubert v. Merrell Dow Pharm., Inc., 113 S.C. 2786 (1993)). For example, in *McCullock v. H.B. Fuller Co.*, 61 F.3d 1038, 1043 (2d Cir. 1993), the cross-examination of plaintiff's expert revealed issues regarding their credentials and credibility. *See also* Conde v. Velsicol Chem. Corp., 24 F.3d 809, 813-14 (6th Cir. 1994) (noting that expert witnesses were unable to explain key changes in test results).

ble for ensuring that judges perform their gatekeeping function.[56]

C. *Effective Gatekeeping*

Effective lawyering has in fact exposed weaknesses in proposed expert testimony. A few cases illustrate this. Following *Daubert*, the Supreme Court spoke again to the issue of expert testimony. In *General Electric Co. v. Joiner*,[57] the Court upheld a district court's decision to exclude expert testimony. The district court had found that plaintiff's expert testimony was not reliable because the studies upon which the testimony was based did not support the expert's conclusions.[58] Plaintiff's expert opined that human exposure to polychlorinated biphenyls (PCBs) caused small cell lung cancer, the disease afflicting the plaintiff.[59] One study showed a correlation between PCBs and alveologenic adenomas (not small cell lung cancer) among infant mice injected directly with large doses of PCBs.[60] Another study failed to associate lung cancer with PCB exposure.[61] Yet another study did not involve PCBs, but mineral oil.[62] Obviously there was not a match between the disease from which plaintiff suffered and the studies relied upon by his expert.

For similar reasons, expert testimony was excluded in *Penney v. Praxair, Inc.*[63] In that case, the plaintiff was on medication while undergoing a Position Emission Tomography (PET) scan of his brain; those in the control group were not.[64] Plaintiff was also sixty-six years old, while the age of the members of the control group was not known.[65] Both factors undermined the reliability of the methodology as both medication and age can affect PET scan re-

56. *Cf.* Cortes-Irizarry v. Corporacion Insular de Seguros, 111 F.3d 184, 188-89 (1st Cir. 1997) (denying counsel's request for a *Daubert* determination, which was raised for the first time on appeal).

57. 118 S. Ct. 512 (1997).

58. *See id.* at 516.

59. *See id.* at 518.

60. *See id.*

61. *See id.* at 518 (citing Pier Alberto Bertazzi et al., *Cancer Mortality of Capacitor Manufacturing Workers*, 11 AM. J. INDUS. MED. 165, 172 (1987); J. Zach & D. Munsch, *Mortality of PBC Workers at the Monsanto Plant in Sauget, Illinois* (Dec. 14, 1979) (unpublished report)).

62. *See General Elec. Co.* at 519 (citing A. Ronneberg et al., *Mortality and Incidence of Cancer Among Oil-Exposed Workers in a Norwegian Cable Manufacturing Company*, 45 BRIT. J. INDUS. MED. 595 (1988) (detailing a study which concluded that exposure to mineral oils probably contributed to development of lung cancer)).

63. 116 F.3d 330 (8th Cir. 1997).

64. *See id.* at 334.

65. *See id.* at 333.

sults,[66] a concern not rebutted by plaintiff's evidence.[67]

Expert testimony was also excluded in *Summers v. Missouri Pacific Railroad System.*[68] There, plaintiff claimed he became ill after inhaling diesel exhaust fumes.[69] The district court found that the accepted methodology for testing reaction to chemical sensitivity had not been employed by plaintiff's expert.[70] Rather, he chose unorthodox methodology generally used by adherents of "multiple chemical sensitivity," or MCS.[71] As MCS could not prove plaintiff's claim against the defendant, nor could MCS testing prove chemical sensitivity, the trial court refused to admit plaintiff's expert testimony.[72]

Again, plaintiff's expert testimony was excluded in *Cabarera v. Cordis Corp.*[73] One expert was excluded because the proposed testimony was based on testing unique to that expert.[74] Moreover, the expert had not subjected his methodology to peer review.[75] In essence, even though credentialed, the *Cabarera* court found that expert testimony has to have a more credible foundation than the unchecked opinion of one person. Nor will unfounded conjecture suffice. Another expert proffered by plaintiff was excluded as he had not performed relevant tests on the plaintiff nor cited outside studies to support his conclusion that plaintiff's illness was caused

66. *See id.*
67. *See id.* at 334.
68. 132 F.3d 599, 603-04 (10th Cir. 1997).
69. *See id.* at 602.
70. *See id.* at 604.
71. *See id.* at 603-04.
72. *See id.* For similar reasons, MCS expert testimony has been excluded in other cases. *See, e.g.*, Frank v. New York, 972 F. Supp. 130 (N.D.N.Y. 1997) (involving state employees who brought an action against the state under the ADA, claiming they had not made reasonable accommodations for workers' multiple chemical sensitivity); Sanderson v. Int'l Flowers & Fragrances, Inc., 950 F. Supp. 981 (C.D. Cal. 1996) (addressing a products liability claim against fragrance makers); Summers v. Missouri Pac. R.R. Sys., 897 F. Supp. 533 (E.D. Okla. 1995) (reviewing a claim by railroad employees of long term negative effects as a result of exposure to diesel fumes); Carlin v. RFE Indus., Inc., No. 88-CV-842, 1995 WL 760739 (N.D.N.Y. Nov. 27, 1995) (excluding testimony where an employee claimed harm from exposure to isopropanol alcohol, freon, and other chemicals on the job); Bradley v. Brown, 852 F. Supp. 690 (N.D. Ind. 1994) (deciding employee personal injury claims stemming from exposure to pesticides), *aff'd*, 42 F.3d 434 (7th Cir. 1994).
73. 134 F.3d 1418 (9th Cir. 1998) (determining a products liability action against a brain shunt manufacturer).
74. *See id.* at 1422.
75. *See id.*

by defendant's product, a silicon shunt.[76]

These cases illustrate that gatekeepers have not opened the floodgates. Judges are making serious attempts to ensure the quality of expert testimony. Proposed testimony at the far reaches, for example, where conclusions are based on unfair, unsupportable or irrelevant assumptions, should never reach a jury. Judges are not only obliged to perform a *Daubert* analysis, but may also exclude testimony if the witness is not qualified and exclude evidence under Rules 104 and 403.[77] Moreover, judges may find that although admissible or admitted, expert testimony would be or was inadequate to support a verdict.[78] Where there is a consensus among mainstream scientists, for example the accepted methodology for testing for chemical sensitivity,[79] testimony to the contrary will have a significant hurdle to pass before being admitted. Should it be admitted, it then must withstand attacks on its credibility and veracity.

It is the lack of consensus among mainstream scientists, a form of scientific uncertainty, that underlies the concerns expressed by Foster and Huber. The solution is not to foreclose judicial consideration. Civil litigation and the administration of justice, after all, must progress. Perhaps the scientific community would do well to close the gaps it can, as surely scientists are attempting to do. In the meantime, while science is uncertain, for whatever reason, lack of consensus or conflicting theories, or untested or untestable hypotheses, we have two options: preclude all expert testimony that in some fashion is based on some scientific uncertainty, or admit that evidence, provided it is not irrelevant or without any scientific basis. This is, again, expert opinion proffered solely for the purpose of resolving litigation. A determination about the scientific validity of an expert's testimony does not determine the scientific validity in any other sense. Scientists are free to test, criticize and publish their findings. Perhaps the decisions of courts will provide an impetus to do so.

---

76. *See id.* at 1423.

77. *See* FED. R. EVID. 104 & FED. R. EVID. 403.

78. *See* Wright v. Williamette Indus., Inc., 91 F.3d 1105, 1108 (8th Cir. 1996) (reversing denial of motion for judgment as a mater of law); Conde v. Velsicol Chem. Corp., 24 F.3d 809, 814 (1994) (grant of motion for summary judgment affirmed); Elkins v. Richardson-Merrell Inc., 8 F.3d 1068, 1073 (6th Cir. 1993) (affirming the district court).

79. *See* DeLuca v. Merrell Dow Pharm., Inc., 911 F.2d 941, 943 (3d Cir. 1990) (involving a couple seeking damages from a pharmaceutical company for their child's severe birth defects).

D. *Elitism*

We should be mindful of another issue embedded in the controversy over expert testimony: Americans value their day in court. Although Foster and Huber acknowledge this principle in theory,[80] their argument rejects it. If only elite-group expert testimony were admissible, a plaintiff's day may never come. But people are injured. They attribute (rightly or wrongly) their injuries to certain causes, and seek resolution through a court of law rather than no redress at all or in other forums. We generally allow recovery upon proof by the preponderance of the evidence, not scientific certainty,[81] a misnomer in any event. The decision to establish the lowest burden of proof reflects the belief that our legal system is the repository for resolving personal injury disputes. The frequency at which so-called sophist[82] testimony is both presented to a jury and which provides the basis for a verdict is not documented in *Judging Science.* One must wonder if this purported problem is as widespread as the outcry over junk science suggests. Anecdotes do not prove widespread validity.

III. CONCLUSION

In the end, the process of filtering scientific evidence involves weighing conflicting values. On one hand we value our jury system, and on the other we value a high-quality scientific process and the benefits of its results. Foster and Huber would have us tip the scales towards an exclusionary scientific process for all purposes. The Supreme Court disagrees. With over twenty *amicus curiae* briefs filed in *Daubert* and judging by their discussion of the scientific process, the Court was well aware of the stakes at issue. The justices apparently also realized that they were not drastically interfering with the scientific process. Again, at least no one has empirically shown how what I would call "litigation science," science which may or may not be mainstream, but certainly not "junk," and which is used during the course of litigation, have materially altered the

80. *See* FOSTER & HUBER, *supra* note 24, at 22..

81. *See* Goodrich v. Betroski, 99 F.3d 505, 526 (2d Cir. 1996) ("[A] CERCLA plaintiff is not required to prove its case with scientific certainty; a preponderance of the evidence is enough . . . . While certainty is an ideal pursued by scientists and courts alike, it is not always realistic goal in environmental science where certainty can be elusive.") (citations omitted).

82. *See* FOSTER & HUBER, *supra* note 24, at 249-50.

traditional scientific world. What we have, perhaps, are co-existing, sometimes co-dependent worlds. One, in which science used in litigation may pass elite muster, or it may not. Two, the private, self-regulating system of science that exists outside of the legal system. The terrible harm in this is not obvious or proven.